Bay Area Air Quality Management District

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Staff Report

BAAQMD Regulation 8, Rule 45: Motor Vehicle and Mobile Equipment Coating Operations

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STAFF REPORT
Regulation 8, Rule 45: Motor Vehicle and Mobile Equipment Coating Operations

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I. EXECUTIVE SUMMARY

The Bay Area Air Quality Management District (District) regulates emissions of volatile organic compounds (VOC) from automotive refinishing operations through Regulation 8, Rule 45: Motor Vehicle and Mobile Equipment Coating Operations (Rule 8-45). Rule 8-45, which was first adopted in 1989, sets VOC limits on various types of paints and surface preparation solvents used in automotive refinishing. The Rule also regulates coating of original equipment such as heavy duty trucks, buses, trains, golf carts and camper shells. The Rule also requires the use of spray technology that is transfer efficient, to maximize the amount of paint that adheres to the intended surface and minimize overspray. Currently, VOC emissions from automotive refinishing operations in the Bay Area total 5.8 tons per day (tpd).

This proposal would further reduce VOC emissions from automotive refinishing and associated coating operations by incorporating the VOC limits and operational standards contained in the California Air Resources Board (ARB) Suggested Control Measure for Automotive Coatings (SCM). The SCM was developed in 2005 as a guideline to be used by California air districts in amending their automotive refinishing rules.[1]

The proposal also includes new requirements for mobile refinishing operations. Mobile refinishers are typically small, one-person operations that travel from place to place to repair and repaint minor dents and scratches, frequently at auto dealerships. Mobile refinishers would be required to register with the District, and frequent clients, such as auto dealerships, would be required to record mobile refinisher visits. A concurrent amendment is proposed in Regulation 3: Fees, Schedule R: Equipment Registration Fees to recoup costs of inspecting these operations.

The proposed amendments would result in a VOC emission reduction of 3.7 tpd, or about 63 percent of the Bay Area motor vehicle and mobile equipment coating emissions, and cost, on average, $793 per facility. The result is a cost effectiveness of $801 per ton of VOC emissions reduced. A socioeconomic impact analysis found no significant impacts on Bay Area jobs or the economy. An environmental impact analysis found no adverse environmental impacts and a CEQA Negative Declaration is proposed.

II. BACKGROUND

Regulation 8, Rule 45: Motor Vehicle and Mobile Equipment Coating Operations regulates VOC emissions from automotive refinishing operations and coating operations to finish other motor vehicles and mobile equipment. These include heavy duty trucks, trailers, buses, trains, golf carts, camper shells and utility bodies. (The only original equipment manufacturer of automobiles in the Bay Area, New United Motors of Fremont, CA, is subject to Regulation 8, Rule 13: Light and Medium Duty Motor Vehicle Assembly Plants; that rule is designed specifically for assembly line operations.) Most VOCs used as solvents in refinishing coatings are precursors to the formation of ozone. Ozone is formed from the photochemical reaction of oxides of nitrogen (NOx) and VOCs. Ozone can result in reduced lung function, increased respiratory symptoms, increased airway hyper-reactivity, and increased airway inflammation. In addition, VOCs can contribute to the secondary formation of particulate matter (PM). Currently, the San Francisco Bay Area is not in attainment of the State air quality standards for ozone and PM, and ARB has determined that ozone and ozone precursors are sometimes transported from the Bay Area to neighboring air basins. Amendments to Rule 8-45 were included as Control Measure SS 1 in the Bay Area 2005 Ozone Strategy.

A. Automotive Refinishing Operations

Automotive refinishing operations are conducted at auto body repair and paint shops, production auto body paint shops, auto dealership repair and paint shops, fleet operator repair and paint shops, and by mobile refinishers who travel to various sites and do limited body work and repainting at those locations. Many of the facilities do collision repair and some do commercial vehicle refinishing and repair. Mobile refinishing operations are primarily conducted at car dealerships and at facilities that operate fleets of vehicles, like rental car agencies, and government agencies.

There are approximately 1100 automotive refinishing facilities in the District. Facilities that engage in automotive refinishing include auto body repair shops, automotive paint shops, auto dealerships, public transit agencies like Bay Area Rapid Transit, San Francisco Municipal Transit, and Alameda County and Contra Costa County Transit, airports, public works departments, and educational facilities like high schools and community colleges. Overall, the majority of automotive refinishing facilities are small businesses typically having one to five employees. Over 70 percent of the facilities are estimated to have one million dollars or less in annual revenue.[1] Automotive refinishing facilities vary greatly in size and level of sophistication. Some automotive refinishing facilities are medium to large, relatively automated facilities, equipped with spray booths with forced air dryers and filtration, automatic gun cleaners and computerized recordkeeping for coating use; while many of the remaining facilities are typically family-run shops that may have a few employees. There are probably less than 200 mobile refinishers in the District.

1. Process Description

Automotive refinishing consists of refinishing done as a result of collision repair, in which the finish coats must blend into the existing color and surface; and complete refinishing and original equipment painting, where a complete topcoat is applied and color match is only necessary insofar as a utility body or truck trailer is expected to match a truck cab or corporate color scheme. Before a surface can be painted, it is critical that the surface is cleaned and degreased to ensure the undercoatings and topcoatings will bond properly. There are two main categories of automotive coatings: primers or undercoatings and top coats. Primers are applied for fill, corrosion protection and to provide a smooth, uniform surface for the topcoat. Topcoats provide the desired appearance and protection.

2. Surface Cleaning and Preparation

Prior to the application of any coating, it is critical to prepare and clean the underlying metal or plastic surface of dirt and oils. The first step in the process is sanding the surface to remove old paint and rust. The sanding also roughens the surface for the application of a primer coating. Next, dust is removed and then the surface is wiped with solvent to remove grease, oil or road tar. VOCs are released from the evaporation of the solvent from the surface and from the wipe cleaning cloth.

3. Primers

Primers, or undercoatings, include adhesion promoters, pre-coats, pretreatment coatings, primer-surfacers, primer-sealers, and sealers. Primers are used to provide corrosion protection, surface filling properties for dings and scratches, and to bond the substrate to subsequent coats. The primers also provide a smooth surface for the application of the top coat and are sometimes pigmented to reduce the amount of a color coat that would be necessary. Primers typically have high solids content and are, relatively, low in VOC content. Primers are responsible for about seven percent of the total VOC emissions from the coating operations subject to Rule 8-45.

Adhesion Promoter

An adhesion promoter is a coating applied directly to uncoated plastic surfaces to facilitate bonding of subsequent coatings.

Precoats

Precoats are applied to bare metal primarily to etch (reduce the oxidized metallic layer) the metal surface prior to the application of a subsequent primer surfacer. This provides a better bond between the primer and the metal substrate. Developed for use with a water-borne primer-surfacer, they prevent the underlying metal from rusting.

Pretreatment Coatings

Pretreatment coatings are applied directly to bare metal surfaces to provide corrosion resistance and adhesion. Pretreatment coatings contain a small amount of acid to provide surface etching.[2]

Primer-Surfacer

Primer-surfacers provide the majority of the fill for a repair. This provides a uniform surface that covers imperfections prior to a sealer or topcoat. Typically, these are applied to slightly above the surrounding painted area and then, when cured, sanded to obtain a uniform, smooth surface.

Primer-Sealer and Sealers

A primer sealer is a thin-film coating used to isolate the primer-surfacer from the topcoat. The primer-sealer will fill minute sanding scratches, but will not fill voids. It is generally non-sandable, and forms a smooth surface for a topcoat application. An expensive, pigmented topcoat or a color coat will not penetrate through a sealer into underlying primers, resulting in the use of more color coat to provide the desired color and hiding charactistics.

4. Topcoats

Following the application of the primer or primer system (a combination of primers), a topcoat is used to provide the desired appearance characteristics. Topcoats can be single-stage solid colors or coats, single-stage metallic finishes, and multistage systems that may include two or three intermediate coats to create the illusion of depth in the finish, overlaid with clear, protective top coats. When a vehicle is refinished, the painter's job is to deceive the eye into not seeing a demarcation line between the repaired and the un-repaired portion of the vehicle. The topcoat application is usually applied to a larger area than the primered area, in order to smoothly blend new paint into existing paint. Topcoats are estimated to be responsible for about 60 percent of total VOC emissions from automotive refinishing operations.

Color Coatings

Color coatings are pigmented coatings that require a subsequent clear coating for protection, durability, and gloss. Color coatings include metallic / iridescent coatings.

Water-borne color coatings, offered by most manufacturers, greatly reduce VOC emissions from the more common higher VOC solvent-borne coatings. The use of water-borne coatings may require air moving equipment, like fans, in the spray booths to enhance drying. In some cases, heat may be required to speed the drying of the water-borne coatings.[1]

Single-stage Coatings

Single-stage coatings are older technology that is used to refinish vehicles manufactured before the color coat/clear coat finishing systems were developed. These coatings, as the name implies, can be applied in one step as opposed to several, as are required for a color coat / clear coat system. They are also used on trucks and utility bodies where appearance is less critical, on military vehicles and other mobile equipment. Single-stage coatings are often used in production shops where the entire vehicle is painted and can achieve the desired color, protection and durability.

Multi-Color Coatings

Multi-color coatings are also used in automotive refinishing. These coatings are packaged in a single container and result in the appearance of more than one color in a single application. These coatings are also called "splatter" coating due to their appearance and are commonly used on truck beds.

Clear Coatings

Clear coatings contain no or minimal pigments and are applied over a color coating or intermediate translucent coating. The clear coat gives the appearance of depth and shine, and provides protection for the vehicle.

5. Other Coatings

Other coating categories include temporary protective coatings, truck bed liner coatings and underbody coatings. These miscellaneous coating categories account for less than 0.1 percent of the total VOC emissions from automotive refinishing operations.

Temporary Protective Coatings

Temporary protective coatings are used to temporarily protect areas of the vehicle from overspray or mechanical damage. These coatings are used instead of masking in the painting process and may be applied to a vehicle prior to shipment. The temporary protective coatings are removed following the application of a primer or top coat, or to prepare a vehicle for sale.

Truck Bed Liner Coatings

Truck bed liner coatings are rubberized coatings used to protect truck beds from abrasion and to provide traction. They help prevent dings and scratches from cargo.

Underbody Coatings

Underbody coatings were formerly called "rubberized asphaltic underbody coatings." They are applied to the wheel wells, door panels, fenders, undersides of trunks or hoods, and the underside of the vehicle. Underbody coatings are used for sound dampening and for protection from road debris.

6. Spray Equipment Cleaning

Following the application of various coatings, the spray equipment must be properly maintained and thoroughly cleaned to ensure the consistent application of a quality finish. There are two primary methods of cleaning spray equipment: the manual cleaning process and mechanical cleaning systems. It is estimated that the solvent used in the equipment cleaning process and surface cleaning and preparation, combined, accounts for over 30 percent of the total VOC emissions from motor vehicle and mobile equipment coating operations.

B. Regulatory History

1. The Current Rule

Rule 8-45 was adopted on June 7, 1989, and addressed VOC emissions from automotive refinishing operations. The Rule applied to auto body shops, manufacturers and sellers of automotive refinishing coatings, and manufacturers of heavy equipment like passenger buses and heavy duty trucks. (Original equipment manufacturers (OEM) are exempt from Rule 8-45 and are addressed under Regulation 8, Rule 13: Light and Medium Duty Motor Vehicle Assembly Plants.) The Rule initially required the use of spray equipment with higher transfer efficiency for primer coats in July 1990 and for all coatings in January 1991. VOC standards for the various affected coating categories were phased in over three increments, with each increment becoming increasingly more stringent. Each increment became effective on January 1, 1990; January 1, 1992; and January 1, 1995.

Rule 8-45 was significantly amended on November 2, 1994 as a result of an assessment of technology forcing VOC limits set in 1989. The VOC limits were revised to reflect technological progress and to give manufacturers adequate time to bring reformulated products to market. The revision also included incorporating additional VOC standards, which included a 0.6 lb/gal VOC limit for surface preparation solvent, a 0.5 lb/gal VOC limit for temporary protective coating, and a volume limitation on precoat. A new requirement that topcoats be applied in a spray booth or within a particulate filtration system was also added to the Rule.

Rule 8-45 was amended again on January 6, 1999, primarily to allow the use of a precoat under non-water-borne primer-surfacer to prevent corrosion of the metal surface of an auto body.

Currently, Rule 8-45 sets VOC limits for automotive refinishing coatings and solvents used in automotive refinishing operations. Table 1 summarizes the VOC limits for automotive coatings currently contained in the Rule.

Table 1
VOC Limits of Rule 8-45

Rule 8-45 Coating Categories & Solvents	VOC Limits (g/l)	
	Group I[a]	Group II[b]
Pretreatment Wash Primer	780	780
Precoat	580	580
Primer / Primer Surfacer	250	250
Primer Sealer	420	340
Solid Color Topcoat	420	--
Topcoat	--	420
Metallic Iridescent Topcoat	520	420
Multi-Stage Topcoat System	540	--
Camouflage	--	420
Specialty Coatings	840	840
Temporary Protective Coating	60	60
Surface Prep Solvent	72	72
Plastic Surface Prep Solvent	780	780

a. Group I refers to vehicles such as passenger cars, large/heavy duty truck cabs and chassis, light and medium-duty trucks and vans, and motorcycles.
b. Group II refers to public transit buses and mobile equipment.

The Rule also sets transfer efficiency requirements for spray equipment. It requires the use of electrostatic application equipment, high-volume, low-pressure (HVLP) spray equipment, or the District-approved equivalent for applying coatings. In addition, the Rule prohibits anyone from specifying the use of coatings that are not compliant with the above limits for any automotive refinishing operation and it prohibits the sale of non-compliant coatings in the District.

2. Regulatory Activity Since the Last Amendments to Rule 8-45

In October 2005, ARB published the Suggested Control Measure for Automotive Coatings (SCM), which is a guideline regulation for California air districts to use in drafting amendments to their automotive refinishing operations rules and regulations. The SCM is based on information provided to ARB by districts and automotive coating manufacturers.

The SCM recommends that California air districts' automotive refinishing rule be amended to:

1. Combine Groups I and Group II vehicle categories and establish VOC limits by coating category only;
2. Eliminate the composite VOC limit for multistage coating systems and establish independent VOC limits for both the color and clear parts of the multistage coating systems;

3. Combine the primer, primer surfacer, and primer sealer categories and establish a single VOC limit for primers; and
4. Eliminate the general specialty coating category and replace it with specific categories, and corresponding VOC limits.

Since the ARB published the SCM, the South Coast, San Joaquin Valley, and Santa Barbara districts have adopted amendments to their automotive coating rules that incorporate the recommendations of the SCM.

III. PROPOSED AMENDMENTS

The proposed amendments to Rule 8-45 are intended to reduce VOC emissions from automotive refinishing operations. The proposal is based on ARB's 2005 SCM. The proposal also contains provisions designed to address mobile automotive refinishing operations.

A. Coating and Surface Preparation and Cleaning Solvent VOC Limits

The proposed amendments to Rule 8-45 incorporate the VOC limits and definitions contained in the SCM. Several categories of coatings are to be combined. Table 2 shows the current coating categories in the Rule alongside the new corresponding coating categories and the VOC limits for each category that are proposed to become effective in October 2009 and January 2010.

Table 2
Current and Proposed Coating Categories and VOC Limits for Automotive Refinishing Operations

Rule 8-45 Coating Categories	**VOC Limits** (g/l)		**Proposed Coating Categories**	**VOC Limits** (g/l)
	Group I[a]	**Group II[b]**	**Effective Dates:** October 1, 2009 or **January 1, 2010[c]**	
Anti-glare / Safety Coating	--	--	Color Coating	420
Camouflage	--	420		
Multi-Stage Topcoat System	540	--	Clear Coating	250
Pretreatment Wash Primer	780	780	Pretreatment Coating	660
Precoat	580	580	Primer	250
Primer & Primer Surfacer	250	250		
Primer Sealer	420	340	**Primer Sealer**	**250[c]**
Metallic / Iridescent Topcoat	520	420	**Single-Stage Coating**	**340[c]**
Solid Color Topcoat	420	--		
Topcoat	--	420		
Temporary Protective Coating	60	60	Temporary Protective Coating	60
Specialty Coatings (limited by volume)	840	840	Multi-Color Coating	680
			Truck Bed Liner Coating	310
			Underbody Coating	430
			Uniform Finish Coating	540
			Adhesion Promoter	**540[c]**
			Any Other Coating Type	250
Surface Preparation Solvents	72	72	Surface Preparation Solvents	25
Solvents for Plastics Surface Preparation	780	780		

a. Group I refers to vehicles such as passenger cars, large/heavy duty truck cabs and chassis, light and medium-duty trucks and vans, and motorcycles.
b. Group II refers to public transit buses and mobile equipment.
c. The effective date for the **bolded categories – primer sealer, single stage coating and adhesion promoter** – is January 1, 2010.

With the incorporation of the new coatings categories, the coating categories currently contained in the Rule would be either eliminated or subsumed into the new categories. The affected coating categories include multi-stage topcoat, metallic iridescent topcoat, primer sealer, primer surfacer, precoat, camouflage, specialty coating, and anti-glare safety coating.

B. Surface Preparation and Cleaning Solvents

The proposed VOC limit for cleaning materials would be reduced from either 780 or 72 g/l to 25 g/l. The current rule requires that surface preparation solvents meet a 72 g/l VOC standard, except that high-VOC solvents can be used if contained in a hand-held spray bottle. Solvents used for preparing plastic surfaces, such as replacement bumpers, are allowed up to 780 g/l of VOC. The logic of allowing high-VOC solvent in hand-held spray bottles is that, whereas an entire surface will be wiped with solvent to take off dust as a final preparatory step before painting, spots of tar on fenders and bumpers cannot be easily removed without a high-VOC solvent. Although the SCM recommends a 25 g/l VOC limit for surface preparation solvent, the occasional need for higher VOC solvents for certain preparation work is not addressed. It has been reported that, in areas where this limit has gone into effect, auto refinishing facilities are using aerosol cans of cleaning solvent, specifically, bug and tar remover regulated under ARB's Consumer Products Regulation. One automotive products distributor reported that the use of aerosol spray solvent has increased from one or two cans per week to ten per day.

The Santa Barbara APCD adopted a provision to allow a limited amount of higher-VOC solvent for surface preparation to their auto refinishing rule in June 2008. Based on requests from Santa Barbara area auto body shops, they allowed use of up to 20 gallons per year per facility to higher VOC solvent. While this amount is appropriate for the largest shops, staff considers it to be overly generous for smaller outfits and mobile refinishers. Staff proposes a sliding scale of surface preparation solvent usage (20 gallons per year (gpy) for a shop that uses 400 gpy or more of coating; 15 gpy for a shop using 150 gpy or more of coating; and 10 gpy for less than 150 gpy of coating). A VOC limit of 350 g/l (approximately equivalent to ARB's 40 percent VOC by weight standard for bug and tar remover) is proposed. This avoids the excessive cost of numerous aerosol cans and the waste associated with using them.

C. Specialty Coatings: Multi-color Coating, Uniform Finish Coating and Adhesion Promoter

The Rule currently has a volume limitation on the amount of specialty coating that can be used, no more than five percent of all coatings used on a monthly basis, except antiglare/safety coating (primarily used at one Bay Area facility). The purpose of this standard is to limit the use of high VOC coatings renamed as special purpose coatings. The proposed amendments allow three coatings – multi-color coating, uniform finish coating, and adhesion promoter – to have a VOC limit significantly higher than other coating categories. These VOC limits range from 540 to 680 g/l. Multi-color coating shows more than one color when dried. Uniform finish coating is used on spot repairs, those areas where less than an entire panel is refinished. Uniform finish coating is a higher VOC, translucent color coating used to blend and make invisible the demarcation between a repaired area and existing paint. Adhesion promoter is applied to uncoated plastic surfaces to aid bonding of a subsequent coating.

Staff proposes to limit the use of these three coatings to no more than five percent of topcoats used, on a volume basis. Doing so will also satisfy one concern expressed by an EPA staff member about a previous version of the draft amendments, that is, that the removal of the five percent limitation could allow more high VOC specialty coating to be used, which could have been considered a relaxation of the standards in the current rule. Uniform finish coating is less than 0.2 percent of topcoats used on a state-wide basis.

Staff is also proposing a change in a definition recommended in the SCM. A spot repair was defined by the SCM as an area of less than 1.0 square foot in size. This definition was an attempt to limit the amount of uniform finish coating used because uniform finish coating can be used, by definition, only on spot repairs. However, the size limit cannot be determined once the area has been painted and, therefore, the provision as recommended in the SCM would be unenforceable. The volume limitation, however, is an enforceable standard that will prevent over-use of this higher VOC coating and make the amendments approvable by EPA, at such time when the Rule is submitted into the State Implementation Plan.

D. Requirements for Mobile Refinishing Operations

Mobile refinishing operators are not required to have a permit from the District. Because mobile refinishers operate in multiple locations, their operations are currently difficult to track and inspect. Therefore, it is difficult to determine the compliance status of these operations. To address this, provisions specific to mobile refinishing operations are proposed for the Rule. Mobile refinishers would be required to register their operations with the District and upon request, notify the District of their schedule of clients. During operations, mobile refinishers have to comply with the same requirements as stationary refinishers. Mobile refinishers are also required to meet the recordkeeping requirements of the Rule. Clients of mobile refinishers where at least five operations per year or 25 cars have been refinished within a year would have to keep records of the mobile refinisher contracted to, dates of service, and number of vehicles refinished. This requirement primarily affects auto dealerships and will allow staff to cross-check with registered refinishers.

A proposed amendment to Regulation 8, Rule 3: Fees, Schedule R: Equipment Registration Fees, will set an initial registration fee of $100 and a recurring annual fee of $60 for mobile refinishers.

E. Administrative Requirements

1. Compliance Statement Requirement

The proposed amendments would require manufacturers and re-packagers of automotive coatings, components and solvents to provide written information necessary to verify compliance on product technical data sheets or the equivalent. Manufacturers must also provide recommended mix ratios and sufficient information to determine emissions, such as weight VOC or volume VOC and density of VOC.

2. VOC Labeling Requirements

Effective October 1, 2009, the proposed amendments would require manufacturers and re-packagers of automotive coatings and components to label all containers with the coating use category and the VOC content. The VOC content would also be required for cleanup and surface preparation solvents.

3. Recordkeeping Requirements

The proposal would simplify recordkeeping requirements for automotive refinishing operations that are subject to Rule 8-45. Monthly records of the totals of coating used would still be required. Beyond that, operators would need to keep the compliance statements provided by the manufacturers or distributors of coatings and record the mix ratios of coating components used.

The clients of mobile refinishing operators who have had at least five automotive refinishing operations conducted in a year or had at least 25 vehicles refinished within a year would be required to maintain records detailing the following:

- The name(s), address(es), phone number(s), retail tax license number(s), and valid District permit or registration number(s);
- The dates each mobile refinishing operation occurred; and
- The number of vehicles refinished on each occasion.

These requirements for mobile refinishing clients would take effect on October 1, 2009.

F. Test Methods

The Rule lists several test methods to demonstrate compliance. These include methods for determining VOC, acid, metallic and exempt compound contents of coatings and solvents. Methods for determining overall abatement efficiency, transfer efficiency, and HVLP equivalency are also included.

IV. EMISSIONS and EMISSION REDUCTIONS

The District 2005 emissions inventory indicates that VOC emissions associated automotive coating totaled approximately 3.99 tons per day (tpd). Also, VOC emissions associated with clean-up and surface preparation solvent use at automotive refinishing operations totaled 1.83 tpd for a total of 5.8 tpd for this industry.

ARB estimated that implementation of the requirements and VOC limits of the SCM would result in an overall emissions reduction of 63 percent. Table 3 presents VOC emissions in the District from the proposed major coating categories and the expected VOC emissions reduction based on the proposal.

Table 3
Estimated VOC Emissions from Automotive Refinishing Operations and Anticipated Reductions Due to the Proposal

Coating Category	VOC Emissions (tpd)	Emission Reductions (tpd)	Percent Reductions (percent)
Clear Coating	0.52	0.31	60
Color Coating	2.48	1.68	68
Pretreatment Coating	0.07	0.04	59
Primer	0.34	0.19	56
Single-Stage Coating	0.55	0.32	58
Uniform Finish Coating	0.02	0.01	63
Surface Prep Solvents	1.83	1.11	61
Total	**5.81**	**3.66**	**63**

Automotive refinishing is a fairly uniform practice throughout California and, consequently, the relative usage of coating is consistent. At the time the SCM was developed, most districts in California had identical VOC limits, with the exception of the South Coast AQMD. Therefore, the reductions estimated for the Bay Area should be consistent with reductions estimated for the entire state.

V. ECONOMIC IMPACTS

Staff conducted a cost and cost effectiveness analysis based information developed by ARB staff and recent cost information provided by several coating distributors, facilities that have already converted to lower VOC coating, and other air districts. A socioeconomic analysis was also performed along with an incremental cost effectiveness analysis and an analysis of the potential impact to the District.

A. Costs and Cost Effectiveness

ARB staff performed a cost analysis to estimate the cost of implementation of the SCM. ARB estimated the cost of implementation of the new standards to be $13.9 million annually. This reflected increased costs of compliant coatings, additional operation and maintenance costs and need to purchase additional equipment, such as water-compatible spray guns, forced air and heating equipment. The average cost of compliance was estimated to be about $2300 per facility. At the time ARB's analysis was conducted, few if any, automotive refinishing facilities were using coating products that met the limits of the then developing SCM. However, since ARB's approval of the SCM in 2005, a considerable number of facilities throughout the state, including the Bay Area, have converted to coating products that comply with the proposed VOC limits. District staff's recent economic evaluation indicates that the actual costs to comply with the proposed VOC limits may be lower than originally estimated by ARB.

The jobbers (automotive coating distributers) representing the several coating manufacturers have been instrumental in helping facilities make the conversion from solvent-based color coats to waterborne. This assistance includes complimentary training (both onsite and remote), discounted equipment in some cases such as mixing machines, water-tolerant spray guns, heating and air moving equipment, and continued customer service to help facilities experience a smooth transition. Discussions with these jobbers and converted facility operators indicate that the costs to switch to waterborne coating products should be less than the costs estimated by the ARB. The approximate cost per booth to convert to waterborne color coat is estimated to be from $950 to $1250. The equipment and costs are listed in Table 4.

Table 4
Cost Estimation for the Use of Waterborne Color Coats per Spray Booth[3, 4]

Equipment	Costs
Venturi Fans (pair) and Stand	$300 -$500
Infrared Heating Lamps	$200
Stainless Steel Spray Gun	$400-$500
Waste Container	$50
Total Costs	**$950-$1250**

Facilities with multiple booths may elect to purchase only one spray gun for use in two booths. Applying these equipment costs to the automotive refinishing facilities permitted by the District along with the recurring costs, which includes the cost of coatings and maintenance as developed by ARB, results in a total annual cost of $1.2 million.

Coatings formulated to meet the proposed VOC limits can cost up to 20 percent more than currently compliant coatings on a volumetric basis. However, because the new formulations have greater solids contents and use a waterborne reducer instead of a solvent-based reducer, it is expected that the cost of using the new formulations would be about equal to, if not less than, the cost of the currently used coating.[5] The overall cost effectiveness of the proposal is estimated to be $800 per ton of VOC reduced.

Finally, the proposal would require mobile refinishing operators to register with the District. The cost of the initial registration would be $100, with an annual recurring fee of $60.

B. Socioeconomic Impacts

Section 40728.5 of the California Health and Safety Code requires an air district to assess the socioeconomic impacts of the adoption, amendment or repeal of a rule if the rule is one that "will significantly affect air quality or emissions limitations." Bay Area Economics of Emeryville, California has prepared a socioeconomic analysis of the proposed amendments to Rule 8-45. District staff has reviewed and accepted this analysis. Based on the analysis, District staff has concluded that the affected facilities

should be able to pass through the costs of compliance with the proposed rule without significant economic dislocation or loss of jobs.

C. Incremental Cost Effectiveness

The District is required to conduct an incremental cost effectiveness analysis prior to adopting any proposed Best Available Retrofit Control Technology rule or feasible measure pursuant to Health and Safety Code Section 40920.6 (a)(3). Under this section, the District must: (1) identify one or more control options achieving the emission reduction objectives for the proposed rule; (2) determine the cost effectiveness for each option; and (3) calculate the incremental cost effectiveness for each option. To determine incremental costs, the District must "calculate the difference in the dollar costs divided by the difference in the emission reduction potentials between each progressively more stringent potential control option as compared to the next less expensive control option."

The alternative control option used in this analysis assumes that all spray booths operated by automotive refinishing facilities are abated by add-on controls rather than through a reduction in the VOC limits of color and clear coats. The add-on control system chosen is a hybrid of carbon adsorption and catalytic incineration control systems to achieve an overall control efficiency of 85 percent. A control system is estimated to cost approximated $175,000 per spray booth for capital and installation with annual operation and maintenance (O&M) costs estimated to be 10 percent of the capital cost, $17,500.[6] Installation of this control technology on the 1400 spray booths permitted in the District (some facilities have multiple booths) results in a total District-wide cost of $245 million. Applying a control efficiency of 85 percent to the 3.6 ton per day of emissions coating operations conducted in a spray booth would achieve an emissions reduction of 3.0 tons per day. It is assumed that surface preparation and cleaning operations would be conducted outside the spray booth. Amortizing the capital and installation cost at 7.5 percent interest for 10 years ($25,000) and adding the O&M cost ($17,500) results in an annualized cost of $59.5 million District-wide.

Incremental cost effectiveness can be calculated according to the following formula:

$$\mathbf{ICE} = \frac{\mathbf{C}_{\mathbf{option}} - \mathbf{C}_{\mathbf{proposal}}}{\mathbf{ER}_{\mathbf{option}} - \mathbf{ER}_{\mathbf{proposal}}}$$

Where:

$\mathbf{ICE}$ = the incremental cost effectiveness.
$\mathbf{C}_{\mathbf{option}}$ = the annualized cost of the control option.
$\mathbf{C}_{\mathbf{proposal}}$ = the annualized cost of the proposal.
$\mathbf{ER}_{\mathbf{option}}$ = the potential annual emissions reduction that would be achieved by the control option.
$\mathbf{ER}_{\mathbf{proposal}}$ = the potential annual emission reductions that would be achieved by the proposal.

$$ICE = \frac{\$59.5\ mm - \$1.1 mm}{(3.6\ tpd - 3.8\ tpd) \times 365\ days}$$

$$= \$160{,}000\ per\ ton$$

Consequently, due to the extremely high cost effectiveness of this option, staff does not recommend mandatory abatement for all spray booths. There have been no other increments identified that would achieve the same emission reduction objective.

D. District Impacts

The proposed amendments will have very little impact on District resources. The affected sources are currently permitted and inspected by district staff. The proposal will also require mobile refinishers to register with the District, which will make them easier to track and evaluate for compliance. The initial and annual registration fees are expected to cover the increased inspection activity at these sources.

VI. ENVIRONMENTAL IMPACTS

A. CEQA

Pursuant to the California Environmental Quality Act, the District has had an initial study for the proposed amendments prepared by Environmental Audit, Inc. The initial study concludes that there are no potential significant adverse environmental impacts associated with the proposed amendments. A negative declaration is proposed for approval by the District Board of Directors. The negative declaration and initial analysis will be available for comment between October 27 and November 17, 2008.

B. Greenhouse Gas Emissions

In June, 2005, the District's Board of Directors adopted a resolution recognizing the link between global climate change and localized air pollution impacts. Climate change, or global warming, is the process whereby emissions of anthropogenic pollutants, together with other naturally-occurring gases, absorb infrared radiation in the atmosphere, leading to increases in the overall average global temperature.

While carbon dioxide (CO_2) is the largest contributor to global warming, methane, halogenated carbon compounds, nitrous oxide, and other species also contribute to climate change. Gases in the atmosphere can contribute to the greenhouse effect both directly and indirectly. Direct effects occur when the gas itself is a greenhouse gas (GHG). While there is relative agreement on how to account for these direct effects of GHG emissions, accounting for indirect effects is more problematic. Indirect effects occur when chemical transformations of the original compound produce other GHGs, when a gas influences the atmospheric lifetimes of methane, and/or when a gas affects

atmospheric processes that alter the radiative balance of the earth (e.g., affect cloud formation).

VOCs have some direct global warming effects; however, they may also be considered greenhouse gases due to their indirect effects. VOCs react chemically in the atmosphere to increase concentrations of ozone and may prolong the life of methane. The magnitude of the indirect effect of VOCs is poorly quantified and depends on local air quality. Global warming not only exacerbates ozone formation, but ozone formation exacerbates global warming. Consequently, reducing VOCs to make progress towards meeting California air quality standards for ozone will help reduce global warming.

As result of the proposed amendments, it is expected that most facilities will have to purchase and use, at a minimum, venturi fans and/or infrared heating lamps to operate competitively if they do not already own them. Use of these devices would result in a negligible increase in energy consumption and, subsequently, a negligible increase in CO_2 emissions. However, this small potential increase in CO_2 emissions would be greatly offset by the reductions in VOC emissions (which also contribute to GHG emissions) due to the implementation of the reduced VOC limits. Also, the use of waterborne coatings results in a smaller waste stream. Operators typically use a concentrator that allows paint solids to settle from leftover paint and water used to wash spray equipment. The settled paint is filtered and concentrated and allowed to dry. The filtered water may be re-used for cleaning or allowed to evaporate. Ultimately, there is less waste material to be transported for reclamation or disposal through incineration resulting in less CO_2 emissions than when using solvent-based coatings.

District VOC rules typically allow a facility to reduce emissions to the atmosphere through the use of air pollution abatement equipment as an option to the use of low-VOC products. Such abatement equipment may be thermal or catalytic oxidizers or carbon adsorption. These devices are rarely a cost-effective solution except in the largest facilities, however, if they were employed, emissions of GHG could be expected to increase due to the use of natural gas to fire an oxidizer. Historically, low-VOC products have been successfully implemented. Because air pollution abatement equipment is not expected to be used to meet the VOC limits in the proposed rule amendments, no increase in GHG emissions are expected.

C. Tertiary Butyl Acetate

During this rule development process, a stakeholder requested that the District exempt tertiary butyl acetate (TBAc) from the VOC definition in the Rule. Tertiary butyl acetate is a common name for acetic acid, 1,1-dimethlyethyl ester. It is a colorless, flammable liquid with a strong odor. In 2004, the US EPA found that TBAc has a negligible contribution to photochemical reactivity (ozone formation). Consequently, it is exempt from the federal list of VOC. Lyondell Chemical (now LyondellBasell) requested a similar exemption from ARB, which would only apply to the state-wide consumer products rule (17CCR, commencing at §94520). In 2005, ARB developed the Automotive Refinishing SCM, and performed an assessment of the potential adverse health impacts of an exemption for TBAc under the provisions of CEQA. The

assessment team included staff from ARB, Office of Environmental Health Hazard Assessment (OEHHA), State Water Resources Control Board (SWRCB) and the Department of Toxic Substances Control (DTSC). The assessment analyzed the potential health impacts associated with replacement of solvents commonly used in automotive refinish coatings with TBAc, including acetone and PCBTF (VOC-exempt solvents) and a variety of non-exempt solvents. The assessment did not consider the impacts of replacing water with TBAc. The assessment found that 33 to 54 tons per day of TBAc could be emitted in California, the majority from auto refinishing operations.

TBAc has low acute inhalation, oral, dermal and ocular toxicity, and no impacts in several short term genotoxicity assays. No chronic, developmental, or reproductive toxicity data are available. No carcinogenicity data are available. ARB concluded that it is not possible to assess the long-term exposure non-cancer health effects of TBAc. In studies with rats, TBAc has been shown to substantially metabolize to tertiary butyl alcohol. Studies have shown that tertiary butyl alcohol may cause oxidative DNA damage and has been shown to induce liver tumors in rats and mice. Because of this, concern has been expressed that TBAc may be a cancer risk to humans. Comments have suggested that the rat and mouse data are not relevant to humans, but there is insufficient evidence to show that the tertiary butyl alcohol carcinogenicity data are not relevant to humans.[7]

ARB concluded that TBAc should be considered to pose a cancer risk to humans, but recommended an exemption for the compound in the SCM. ARB estimated a lifetime population-weighted exposure risk of 11 in one million excess cancers for populations near facilities with high TBAc emissions. ARB did not estimate a cancer risk for exposed worker populations, but found that it would be much higher. In recommending the exemption from the VOC definition in the SCM, ARB recommended that air districts determine whether the use of TBAc would pose a risk of unacceptable exposures. Subsequent to these findings, ARB promulgated an SCM for architectural coatings in 2007 and revisions to the state-wide consumer products regulation in 2008. ARB did not exempt TBAc in either of these processes.

The South Coast has exempted TBAc in their comparable rule (Rule 1151: Motor Vehicle and Mobile Equipment Coating Operations) but only for primers, on the reasoning that complying products were already available for topcoats. The San Joaquin district has exempted TBAc for automotive coatings, but not surface preparation or clean-up solvents. Ventura County has proposed (but not yet adopted) a complete exemption. TBAc, if exempted, could replace other compounds with toxicity concerns, such as xylene, although it could also be used to replace water in waterborne coatings and/or water or other exempt compounds in cleaning solvents.

In 1993, the Air District Board of Directors adopted a policy directing staff to consider the impacts of negligibly photochemically reactive compounds on a rule-by-rule basis and not exempt compounds that deplete stratospheric ozone or are toxic. To this end, staff has recommended deleting exemptions for stratospheric ozone depleting compounds such as 1,1,1 trichloroethane and toxic compounds such as methylene chloride. Further,

staff has not added compounds to the exempt list without an indication that they were useful in meeting VOC limits in particular rules.

There is no clear evidence that TBAc is a human carcinogen, however, there is also a lack of long-term health effects studies to make a definitive determination. Because the South Coast and San Joaquin have already adopted amendments to their motor vehicle and mobile equipment coating rules, products have already been developed to meet the lower VOC standards that do not rely on TBAc for compliance. These coatings are commercially available and in use, including in the Bay Area.

Because TBAc may potentially pose a cancer risk to humans, and because compliant coatings that do not contain TBAc are already available on the market and being used, staff does not recommend an exemption for TBAc in Rule 8-45 at this time.

VII. REGULATORY IMPACTS

Section 40727.2 of the Health and Safety Code requires an air district, in adopting, amending, or repealing an air district regulation, to identify existing federal and district air pollution control requirements for the equipment or source type affected by the proposed change in air district rules. The air district must then note any difference between these existing requirements and the requirements imposed by the proposed change. It had been determined that two federal air pollution control regulations apply to automotive refinishing operations:

1. 40 CFR Parts 9 and 59 – National Volatile Organic Compound Emissions Standards for Automotive Coating (National Rule), and

2. 40 CFR Part 63, Subpart HHHHHH – National Emission Standards for Hazardous Air Pollutants: Paint Stripping and Miscellaneous Surface Coating Operations at Area Sources (NESHAP).

A. Comparison with the National Rule

The National Rule sets VOC limits for some of the automotive coating categories in the proposal. Table 5 indicates that the proposed VOC limits are significantly more stringent compared to limits set forth in the National Rule.

Table 5
Comparison of the National Rule with the Proposal

Coating Category	National Rule VOC Limits (g/l)	Coating Category	Proposed Rule 8-45 VOC Limits (g/l)
Pretreatment Wash Primer	780	Pretreatment Coating	660
Primer / Primer Surfacer	580	Primer	250
Primer Sealer	555		
Single / Two-Stage Coating	600	Color & Clear Coating	250-420
Topcoats ≥ 3 Stages	630	Color & Clear Coating	250-420
Multi-Colored Topcoats	680	Multi-Colored Coating	680
Specialty Coatings	840	Truck Bed Liner Coating Underbody Coating Uniform Finish Coating Adhesion Promoter	250-540

B. Comparison with the NESHAP

The NESHAP regulates automotive refinishing operations along with other area sources. The main purpose is to reduce emissions of several hazardous air pollutants (HAP): chromium, lead, manganese, nickel, and cadmium. These metals are found in the pigments in some colors. Table 6 compares the general requirements of the NESHAP with those of the proposal. Because the District requires filtration for the application of all topcoats and filters of 98 percent efficiency are readily available, the District rule is as stringent as the NESHAP.

Table 6
Comparison of the NESHAP with the Proposal

NESHAP Requirements affecting automotive refinishing operations	Equivalent Requirements
Painter Training	No equivalent requirement
Filtration with 98% capture efficiency	Properly maintained and operated filtration
Spray booths used to refinish complete vehicles or equipment must be enclosed with negative pressure of 0.05" of water	No equivalent requirement, permit conditions
Spray booths used to coat parts or products must have 3 walls/side curtains and ventilated with negative pressure	No equivalent requirement
Use HVLP spray gun, electrostatic application, airless or air-assisted airless spray gun, or equivalent.	Yes: § 8-45-303
No atomization or spraying of cleaning solvent outside a container when cleaning spray gun.	Yes: § 8-45-308

VIII. RULE DEVELOPMENT / PUBLIC CONSULTATION PROCESS

The process to bring this proposal to the Board of Directors has been a comprehensive process involving automotive coating manufacturers, their distributors and trade associations, and consultation with other regulatory agencies such as ARB, EPA, and other California air districts. In the development of this staff report, the previous workshop report and associated Public Workshops, and proposed amendments District staff has:

- Participated in the development of ARB's Automotive Refinishing SCM;
- Held meetings and conference calls with automotive coatings manufacturers and distributors;
- Attended automotive coatings manufacturers demonstrations and training seminars;
- Hosted meetings with the Bay Area Automotive Refinishing Association;
- Visited numerous automotive refinishing facilities.

District staff also collected information on each of the 1100 motor vehicle and mobile equipment coating facilities permitted in the Bay Area to help estimate emissions, emission reductions and costs. Staff developed the economic analysis based on the analysis presented in the 2005 SCM staff report and by additional costing information provided by coating distributors and facility operators in the Bay Area.

Staff also hosted a series of Public Workshops to inform and solicit comments from the affected industries and interested public on the proposed amendments to Rule 8-45. A morning workshop was held in San Francisco on August 25, 2008, and two evening workshops were hosted in San Jose and San Pablo on August 26 and 27, respectively. The attendance at these workshops ranged between 40 and 60 individuals and included automotive coating and chemical manufacturers and distributors, automotive refinishing facility operators, mobile refinishers, and staff members from ARB, EPA, other air districts and other environmental agencies.

Comments presented during and subsequent to the workshops focused primarily on:

- The cost of equipment needed to use waterborne coatings;
- The proposed compliance date;
- Clarification of definitions;
- A proposed compliance option based on the reactivity of organic compounds in the coating rather than the traditional measurement by mass (grams VOC per liter of coating); and
- A VOC exemption for TBAc.

As a result of these comments and further discussions and analyses, several changes have been made and are reflected in this proposal:

- Staff investigated and updated the costs of compliance and found that the original estimate to be accurate, if not overly conservative;
- Effective dates for compliance were delayed to October 1, 2009 and January 1, 2010 to provide sufficient time for Bay Area shops to transition to compliant coating products;
- Definitions were clarified;
- The reactivity based option was removed;
- Staff evaluated TBAc and does not propose to exempt it.

IX. CONCLUSION

Pursuant to the California Health and Safety Code Section 40727, before adopting, amending, or repealing a rule the Board of Directors must make findings of necessity, authority, clarity, consistency, non-duplication and reference. The proposal is:

- Necessary to supplement the District's ability to meet the commitment made as part of the District's 2005 Ozone Strategy in Control Measure SS 1 to attain the State one-hour ozone standard, as well as meet transport mitigation requirements;
- Authorized by California Health and Safety Code Section 40702;
- Clear, in that the new regulation specifically delineates the affected industries, compliance options and administrative and monitoring requirements for industry subject to this rule;
- Consistent with other District rules, and not in conflict with state or federal law;
- Non-duplicative of other statutes, rules or regulations; and

- Properly references the applicable District rules and test methods and does not reference other existing law.

A socioeconomic analysis prepared by Bay Area Economics has found that the proposed amendments would not have a significant economic impact or cause regional job loss. District staff have reviewed and accepted this analysis. A California Environmental Quality Act analysis prepared by Environmental Audit, Inc., concludes that the proposed amendments would not result in any adverse environmental impacts. District staff have reviewed and accepted this analysis as well. A Negative Declaration for the proposed amendments has been prepared and will be circulated for comment.

Staff recommends the adoption of the proposed amendments to Regulation 8, Rule 45: Motor Vehicle and Mobile Equipment Coating Operations, adoption of the proposed amendment to Regulation 3: Fees, Schedule R: Equipment Registration Fees, and approval of a CEQA Negative Declaration.

X. REFERENCES

[1] "Staff Report for the Proposed Suggested Control Measure for Automotive Coatings," Air Resources Board, October 2005.

[2] Auto Body Surface Coating: "A Practical Guide to Reducing Air Emissions," Small Business Pollution Prevention Center, Iowa Waste Reduction Center, University of Northern Iowa, 1998

[3] Rob Casaleta, Sherwin-Williams, Conversation with Victor Douglas, September 5, 2008.

[4] Jeff Hartl, AMX, Phone conversation with Victor Douglas, September 8, 2008.

[5] Tom Laginess, BASF, Phone conversation with Victor Douglas, March 7, 2008.

[6] CAPCOA 2003 Engineering Symposium, April 1, 2003.

[7] Luo, D, PhD, et al, Environmental Assessment of *Tertiary*-Butyl Acetate (DRAFT) Staff Report, June 2005, CARB http://wwww.arb.ca.gov/research/reactivity/tbac1.pdf